The invention claimed is:

1. A bumper system comprising:

a beam; and

a thermoformed energy absorber having a base flange and thermoformed crush boxes formed perpendicularly into the base flange, the crush boxes having at least one planar sidewall and a face wall to form a box shape.

2. The bumper system defined in claim 1, wherein the at least one sidewall includes sidewalls that are generally orthogonally related.

3. The bumper system defined in claim 1, wherein opposing ones of the sidewalls are generally parallel, keeping in mind draft angles to facilitate forming the parts.

4. The bumper system defined in claim 1, wherein the thermoformed energy absorber includes a material having a memory that causes the material to recover after impact.

5. The bumper system defined in claim 4, wherein the material is a polyethylene.

6. The bumper system defined in claim 1, wherein the at least one sidewall includes a front portion defining a first plane, a second portion defining a second plane parallel the first plane, and an offset connecting portion that, when the bumper system is impacted, cause the first and second portions to telescope overlapping onto each other.

7. The bumper system defined in claim 1, including a sheet adhered to the thermoformed energy absorber, the sheet having portions forming air-filled air-cushioning pockets under the crush boxes.

8. The bumper system defined in claim 7, wherein the sheet includes at least one restricted air release port in each of the pockets.

9. The bumper system defined in claim 1, including mating surfaces on the beam and the energy absorber for frictionally retaining the energy absorber to the beam without separate fasteners.

10. A bumper system comprising:

a beam; and

a thermoformed energy absorber having a base flange and thermoformed longitudinally-elongated crush boxes formed generally perpendicularly into the base flange.

11. The bumper system defined in claim 10, wherein the crush boxes include opposing walls that are generally planar and parallel, keeping in mind opposing draft angles of the opposing walls.

12. The bumper system defined in claim 11, wherein the crush boxes have a transverse cross section with a maximum thickness dimension of about 35 mm.

13. The bumper system defined in claim 12, wherein the depth dimension is a maximum of about 25 mm in at least some locations.

14. The bumper system defined in claim 13, wherein the depth dimension varies to a minimum depth of about 10 mm.

15. A bumper system comprising:

a beam; and

a thermoformed energy absorber having a base flange and thermoformed crush boxes with generally parallel sidewalls formed generally perpendicularly into the base flange, the sidewalls having draft angles to permit formation by a vacuum-forming process.

16. The bumper system defined in claim 15, wherein the wall thicknesses are less than about 2.0 mm.

17. The bumper system defined in claim 15, wherein the thermoformed energy absorber includes a material having a memory and that will recover after being crushed to a near-original shape.

18. The bumper system defined in claim 17, wherein the material is a polyethylene.

19. A bumper system comprising:

a bumper beam with a recess feature in its face; and

a thermoformed energy absorber having a base wall with thermoformed features engaging the recess feature.

20. The bumper system defined in claim 19, wherein the recess feature includes a longitudinally-extending channel formed in a face of the beam.

21. A bumper system comprising:

a metal tubular bumper beam having a face;

a first polymeric energy absorber having energy-absorbing blocks selected from one or both of hollow crush boxes and foam blocks; and

a thermoformed second polymeric energy absorber covering a substantial portion of a front of the first polymeric energy absorber.

22. The bumper system defined in claim 21, wherein the first and second polymeric energy absorbers include mating surfaces that frictionally and detentingly engage to retain the energy absorbers together.

23. A bumper system comprising:

a bumper beam having a face; and

an energy absorber covering the face, the energy absorber including a thermoformed first sheet forming crush boxes with sidewalls designed to absorb energy and including a second sheet coupled to the first sheet at selected locations to define pockets of captured air in at least some of the crush boxes.

24. The bumper system defined in claim 23, wherein the first sheet includes polyethylene material.

25. The bumper system defined in claim 23, wherein the first sheet is made of a material having a memory, such that the sidewalls of the crush boxes recover after a crushing impact.

26. A method of providing impact resistance comprising steps of:

providing a bumper system including a first sheet with thermoformed sidewalls forming crush boxes and a bonded second sheet forming air pockets under at least some of the crush boxes of the first sheet; and

absorbing impact during a crash including in a first step at least partially collapsing the sidewalls of the crush boxes to absorb some of the energy of impact, and including a second step of at least partially collapsing the air pockets and compressing air therein to absorb additional of the energy of impact.

27. An energy absorber comprising:

a sheet of thermoformable polymeric material defining a base wall and including a plurality of hollow energy-absorbing crush boxes thermally formed from and protruding from the base wall, the crush boxes defining a region with at least two different heights that are alternatingly positioned and intermixed so that upon an initial part of an impact stroke by an object, longer ones of the crush boxes are initially crushed to provide a first level of energy absorption, and upon a later part of the impact strike, shorter ones of the crush boxes are engaged and crushed to provide a second higher level of energy absorption.

28. The energy absorber defined in claim 27, wherein the longer ones of the crush boxes include first flanges spaced from the base a first distance, and first walls supporting the first flanges, and wherein the shorter ones of crush boxes include second flanges spaced from the base a second distance different than the first distance, and second walls supporting the second flanges; whereby during a first portion of an impact stroke, the energy absorber provides a first force-versus-displacement curve as the first flange is initially engaged and the first walls begin to compress, and during a second portion of the

impact stroke, the energy absorber provides a second larger force-versus-displacement curve as both the first and second flanges are engaged and the first and second walls compress.

29. The energy absorber defined in claim 27, wherein the plurality of energy-absorbing crush boxes include first crush boxes including the first flanges, and second crush boxes including the second flanges, the first and second crush boxes being spaced laterally apart on the base.

30. The energy absorber defined in claim 27, wherein first and second crush boxes are separately formed on the base and spaced from each other in directions parallel the base.

31. The energy absorber defined in claim 27, wherein the base is curvilinear to match an aerodynamic swept front surface of a bumper beam

32. The energy absorber defined in claim 27, wherein the base is flexible and bendable and adapted to engage a curvilinear swept beam.

33. The energy absorber defined in claim 27, wherein the energy absorber has a max depth of about 30 mm.

34. The energy absorber defined in claim 27, wherein the energy absorber has a max depth of about 20 mm.

35. The energy absorber defined in claim 27, wherein a material of the energy absorber has a memory and the energy absorber is adapted to recover to near original shape after impact.

36. The energy absorber defined in claim 27, including a backing sheet engaging the base wall to create trapped-air pockets.

37. An energy absorber comprising:

first and second sheets of thermoformable polymeric material defining first and second base walls, the first sheet including a plurality of first crush boxes extending from the first base wall toward the second base wall, and the second sheet including a plurality of second crush boxes extending from the second base wall and engaging the first base wall and further including a plurality of third crush boxes engaging the first crush boxes.

38. An energy absorber comprising:

a first sheet of thermoformable polymeric material defining a base wall and including a plurality of crush boxes formed therein, the crush boxes each including a sidewall configured to absorb significant energy when impacted, the crush boxes further including a bottom flange spaced from the base wall and closing a first end of the crush boxes, and an open second end defined by marginal material on the base wall; and

a second sheet bonded to the marginal material and covering the second end to form an air pocket within the individual crush boxes, such that trapped air within the crush boxes acts as an air cushion upon impact.

39. An energy absorber for a vehicle bumper system, comprising:

first and second sheets of thermoformable material, each having a base flange and thermoformed crush boxes formed generally perpendicularly into the associated base flanges, at least some of the crush boxes of the second sheet aligning with and fitting partially into corresponding ones of the crush boxes of the first sheet to trap air therein, wherein the crush boxes and also the trapped air provide energy absorption upon impact.

40. The energy absorber defined in claim 39, wherein one of the first and second sheets includes an orifice for restricted escapement of the trapped air.

41. The energy absorber defined in claim 39, wherein the first and second crush boxes have flat sidewalls and are pyramid shaped.

42. The energy absorber defined in claim 41, wherein the flat sidewalls of the corresponding first and second crush boxes support each other during a vehicle impact.

43. A vehicle bumper system comprising a reinforcement beam adapted for mounting to a vehicle, and having a face, and the energy absorber defined in claim 39 positioned on the face.

44. The vehicle defined in claim 43, including a second energy absorber that is injection molded and that includes walls forming a honeycomb shape, the second energy absorber being positioned partially between the beam and the second sheet.